AMENDMENT TO THE CLAIMS

1. (Previously Presented) A semiconductor optical device comprising:

a first semiconductor layer of a first conductivity type which is formed on a semiconductor substrate and includes one or more material layers;

a second semiconductor layer which is formed on the first semiconductor layer and includes one or more material layers; and

a third semiconductor layer of a second conductivity type which is formed on the second semiconductor layer and includes one or more material layers,

wherein one or more layers among the first semiconductor layer, the second semiconductor layer, and the third semiconductor layer have a mesa structure, a lateral portion of at least one of the material layers constituting the first semiconductor layer, the second semiconductor layer, and the third semiconductor layer is recessed, and the recess is partially or wholly filled with an oxide layer, a nitride layer or a combination of them, and the first semiconductor layer and the third semiconductor layer serve as confinement-conducting regions, and a layer including a tunnel junction is further formed in one of the confinement-conducting regions.

2. (Original) The device of claim 1, wherein the oxide layer or the nitride layer or a combination of them is formed using atomic layer deposition.

3. (Previously Presented) The device of claim 1, wherein the oxide layer, the nitride layer or a combination of them is formed of one of ZnO, MgO, TiO_2, Ta_2O_5, ZrO_2, HfO_2, SiO_2, Al_2O_3, Si_3N_4, AlN, AlON and a combination of them.

4. (Original) The device of claim 1, wherein when the first semiconductor layer is a p-type semiconductor layer, the third semiconductor layer is an n-type semiconductor layer and when the first semiconductor layer is an n-type semiconductor layer, the third semiconductor layer is a p-type semiconductor layer.

5. (Original) The device of claim 1, wherein the second semiconductor layer is one of a p-type semiconductor layer, an n-type semiconductor layer, and an undoped semiconductor layer.

6. (Previously Presented) The device of claim 1, wherein the second semiconductor layer is a gain region.

7. (Original) The device of claim 1, wherein at least one reflecting mirror is further formed so as to be parallel with the first semiconductor layer through the third semiconductor layer such that output light is perpendicular to the first semiconductor layer through the third semiconductor layer.

8. (Original) The device of claim 1, wherein at least one reflecting mirror is further formed so as to be perpendicular to the first semiconductor layer through the third semiconductor layer such that output light is parallel with the first semiconductor layer through the third semiconductor layer.

9. (Previously Presented) A semiconductor optical device comprising:

confinement-conducting regions having semiconductor layers, each of which includes one or more material layers wherein a layer including a tunnel junction is further formed in one of the confinement-conducting regions; and

a gain region having a semiconductor layer, which is formed between the confinement-conducting regions and includes one or more material layers,

wherein the confinement-conducting regions and the gain region have a mesa structure, and a lateral portion of at least one of the material layers constituting the semiconductor layers of the confinement-conducting regions and the gain region is recessed, and the recess is partially or wholly filled with an oxide layer, a nitride layer or a combination of them.

10. (Original) The device of claim 9, wherein the oxide layer, the nitride layer or a combination of them is formed using atomic layer deposition.

11. (Original) The device of claim 9, wherein the oxide layer or the nitride layer or a combination of them is formed of one of an aluminum oxide layer, a magnesium oxide layer, an aluminum nitride layer, an aluminum oxygen nitride layer, and a combination of them.

12. (Original) The device of claim 9, wherein the semiconductor layer constituting the confinement-conducting regions is one of a p-type semiconductor layer, an n-type semiconductor layer and a combination of them.

13. (Original) The device of claim 9, wherein the semiconductor layer constituting the gain region is one of a p-type semiconductor layer, an n-type semiconductor layer, and an undoped semiconductor layer.

14. (Cancelled)

15. (Original) The device of claim 9, wherein at least one reflecting mirror is further formed so as to be parallel with the confinement-conducting regions and the gain region such that output light is perpendicular to the confinement-conducting regions and the gain region.

16. (Cancelled)

17. (Original) The device of claim 9, wherein a at least one reflecting mirror is further formed so as to be perpendicular to the confinement-conducting regions and the gain region such that output light is parallel with the confinement-conducting regions and the gain region.

18. (Currently Amended) A semiconductor optical device comprising:

confinement-conducting regions having semiconductor layers, each of the confinement-conducting regions including one or more material layers; and

a gain region having a semiconductor layer, which is formed between the confinement-conducting regions and includes one or more material layers,

wherein the confinement-conducting regions and the gain region have a mesa structure, and a lateral portion of at least one of the material layers constituting the semiconductor layers of the confinement-conducting regions and the gain region is recessed, and the recess is formed by selectively etching the lateral portion of at least one of the material layers and the material layers surrounding the recess are not selectively etched, and the recess is partially or wholly filled by deposition with an oxide layer, a nitride layer or a combination of them,

wherein at least one reflecting mirror is further formed so as to be parallel with the confinement-conducting regions and the gain region such that output light is perpendicular to the confinement-conducting regions and the gain region, and

wherein a layer including tunnel junction is further formed in one of the confinement-conducting regions.

19. (Previously Presented) The device of claim 18, wherein the oxide layer or the nitride layer or a combination of them is formed using atomic layer deposition.

20. (Currently Amended) The device of claim 18, wherein the oxide layer or the nitride layer or a combination of them is formed of one of a ZnO, MgO, ~~TiO2, Ta2O, ZrO2, HfO2, SiO2, Al2O3, Si3N4~~$\underline{TiO_2, Ta_2O_5, ZrO_2, HfO_2, SiO_2, Al_2O_3, Si_3N_4}$, AlN, AlON and a combination of them.

21. (Previously Presented) The device of claim 18, wherein the semiconductor layer constituting the confinement-conducting regions is one of a p-type semiconductor layer, an n-type semiconductor layer and a combination of them.

22. (Previously Presented) The device of claim 18, wherein the semiconductor layer constituting the gain region is one of a p-type semiconductor layer, an n-type semiconductor layer, and an undoped semiconductor layer.

23. (Cancelled)